rience I became more and more familiar with its habits, I found it an easy matter to cultivate it with certainty and in profusion.

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A vacation in the Hawaiian Islands.

DOUGLAS HOUGHTON CAMPBELL.

(Concluded from p. 416.)

Of the trees of this lower forest region, much the most conspicuous is the Aleurites Moluccana, a euphorbiaceous tree, called by the natives kukui, with pale silvery green foliage which makes it noticeable at a long distance. The large oily seeds are used as food; and, formerly at least, the expressed oil was used for various purposes. A little higher up, the koa (Acacia koa), one of the commonest forest trees, abounds. This has phyllodia, like so many of the Australian acacias, and it is the principal timber tree, the wood being not unlike mahogany in appearance. Another conspicuous tree of the higher forest region is the ohia, or mountain apple (Eugenia Malaccensis), one of the Myrtaceæ, a medium-sized tree with beautiful crimson fruits not unlike a bell-flower apple in shape. The pulp is white and watery, pleasant to the taste, and very refreshing. Higher still, the related Metrosideros is very abundant, and with its grey-green leaves and scarlet feathery flowers is a striking object.

Owing to the almost constant rains, most of the valleys are traversed by permanent streams, and the floors of these valleys are very productive. Here are found the principal taro plantations. The taro plant (Colocasia antiquorum), familiar enough in American gardens under the name of Caladium esculentum, is the food staple of the great majority of native Hawaiians. Its large farinaceous tuber, after being deprived of its acrid properties by heat, is either directly baked or boiled for eating, or, more commonly, the baked taro is ground up with water into a sort of porridge, allowed to ferment, and served in the form of "poi". This is a sticky, unpleasant-looking mess, which, nevertheless, appears to be very nutritious.

Beside visiting the isle of Oahu, I made short trips to the islands of Hawaii and Kauai. The former, the largest of the group, and the only one where volcanic action is still going on, is reached by steamer in about thirty-six hours from Honolulu. On the way, the islands of Molokai, Lanai, and Maui are passed. The first, a barren looking and forbidding spot, is the location of the leper settlement, to which all persons afflicted with leprosy are sent as soon as their condition becomes known.

Maui, the largest of the islands next to Hawaii, consists of two portions connected by a narrow isthmus. The whole eastern half is nothing more nor less than the body of an immense extinct volcano, ten thousand feet high, and with a crater nearly ten miles across. The other end of the island is an older formation. This island is said to be very interesting botanically; but, unfortunately, my time did not permit me to visit it.

Very soon after sighting Maui, the three great mountain masses of Hawaii began to loom up. The day was clear, and the whole formation of the island became visible. It consists of three great volcanic cones, of which only one is now active. The highest summit, Mauna Kea, is nearly 14,000 feet above the level of the sea; the next, Mauna Loa, lacks but a few hundred feet of this; yet so great is the breadth of these masses that one fails to realize their immense height. Our first landing was at Mahukona, on the leeward side of the island, a most forlorn expanse of bare lava with scarcely a trace of vegetation, except a few unhappy looking algaroba trees planted about the straggling buildings that constituted the hamlet.

We lay all day at this inhospitable station, not getting away until evening. A beautiful sunset and a fine glimpse of the peak of Mauna Kea glowing with the last rays of the sun, form my most pleasant recollections of this desolate place.

What a change the next morning! On awakening we found ourselves entering the harbor of Hilo. Here everything is as green as can be imagined, and luxuriant vegetation comes down to the very ocean's edge. The town is built on a bay fringed with cocoanut trees and embowered in a wealth of tropical vegetation. Owing to the great annual rainfall (about 180 inches), as well as to the fact that Hawaii is the most southerly of the islands, the vegetation here is the most

luxuriant and tropical found in the whole group. I remained in Hilo for six days and collected some most interesting specimens. Through the kindness of Mr. Hitchcock of Hilo, I was enabled to spend the night at his camp in the woods near the town, and the greater part of two days collecting in the vicinity. The forest here is most interesting. Mr. Hitchcock was starting a coffee plantation and had cut trails through the woods in several directions so that collecting was very convenient. There is great danger of losing one's self in these woods where there are no trails, as much of the forest is an almost impassable jungle. In these moist forests ferns and mosses luxuriate, and every trunk and log is closely draped with those beautiful growths. Flowers are almost entirely wanting, a fact repeatedly observed by collectors in tropical forests. I saw here fully developed specimens of tree-ferns. The finest of these were species of Cibotium. Many had trunks from fifteen to twenty feet high, and some must have been fully thirty. The most beautiful were some with trunks ten to fifteen feet high, as these were more symmetrical and had finer fronds than the taller ones. I measured the leaves of one that had fallen over, and roughly estimated the length as eighteen feet. I have no doubt that specimens fully twenty feet long could be found. These giant fronds, arching high over one's head as one rides on horseback under them, present a sight at once unique and beautiful. Growing upon the trunks of these ferns were many epiphytic species, the most peculiar of which was Ophioglossum pendulum, with long strap-shaped leaves, a foot or two long, and a spike of sporangia sometimes six inches long. Exquisite species of Hymenophyllum and Trichomanes, the most ethereal of all the fern-tribes, with almost transparent, filmy leaves, were common, sometimes completely enveloping the trunks of the trees. Of the terrestrial ferns, which abounded everywhere, two were especially notable as representing groups unknown in the United States. One of these, Gleichenia dichotoma, forms extensive thickets on the borders of the forest, and in the Hilo district extends down almost to the sea-level. The other, Marattia Douglasii, a very large fern with leaves eight to ten feet long in well grown specimens, has fleshy dark green leaves, and thick stipules sheathing the base of the leaf-stalks. Several species of Lycopodium and Selaginella were common, and a good

variety of mosses and liverworts. In these forests wild bananas are common, and most magnificent plants they are. Sheltered from the wind, the superb great leaves develop to their full size, without being torn in the least, and the whole plant is a study of beautiful form and color.

Coffee is being extensively planted in this region as well as upon the lee side of the island, and as the quality of the berry is exceptionally fine, this promises soon to be a leading industry in the Islands.

About Hilo especially, but common also elsewhere, was a very conspicuous black fungus, that covered the leaves completely in many cases, and attacked indiscriminately a great variety of trees.

From Hilo I proceeded to the volcano of Kilauea, some thirty miles distant, and about 4,000 feet above the level of the sea. As this volcano has so often been the theme of travellers' descriptions I will not linger over it. In the vicinity are many interesting plants, among them a species of Vaccinium with sub-acid yellow and red berries something like cranberries. These "ohelo" berries are much esteemed, and are especially good when cooked. Some two miles from the volcano is a superb grove of koa trees, the largest trees I saw anywhere in the Islands. One of these standing alone, and with magnificent spread of branches, must have been ten feet in diameter. The road to the volcano lies for much of the way through a fine forest. In the lower part the ohia trees were loaded with their beautiful crimson fruit and present a very showy appearance. Of flowers, the species of Ipomœa were the most conspicuous; but the scarlet flower-bracts of Freycinetia were conspicuous at times, for here this latter plant may often be seen running to the tops of the tallest trees.

The glory of this road, however, is the tree-ferns, which all along excite one's admiration. The carriage road is not yet completed, and about thirteen miles must be done on horseback. Of this more than a mile is over a corduroy road made out of the trunks of ferns! Such a road, if not very durable, is yet very pleasant to horses. As these trunks lay prostrate, in the damp atmosphere, most of them were already sending out new fronds, and in due course of time, the road will be fringed with a hedge of great fern-leaves. Indeed, in some of the more open parts of the road farther

down, where the ground is completely occupied by a small tree-fern growing in dense thickets, as these are grubbed out to make way for cultivation, their trunks are piled up to form fences, and soon sprout out so that they make a beautiful and close hedge of fern-leaves.

On leaving the volcano, I went down on the other side of the island. The rain being almost entirely intercepted by the mountains, this leeward side is very dry, and the ride to Punaluu, where we were to take the steamer was not especially pleasant. Vegetation is very scanty, and nothing particularly interesting was noted in this line. The soil on this side of the island, especially in the district of Kona, is very fertile, and when water can be had, produces magnificent crops of all the tropical staples, pine-apples, cocoa-nuts, coffee, sugar, etc., all especially fine; and we feasted on these cocoa-nuts and pine-apples as we sailed along this picturesque, if somewhat barren, coast.

A short, flying trip was made to the Island of Kauai, the richest botanically of all the islands, as it is the oldest geologically. According to Hillebrand, not only is the number of species larger than in the other islands, but the species are more specialized. Here I saw several species of the curious woody Lobeliaceæ, of which there are several genera that form either shrubs or small trees. I saw several species of Cyanea, with stems six to eight feet high, with long leaves crowded at the top of the stem and many white or purplish flowers, much like those of Lobelia, but somewhat larger and less open.

As in all the islands, there is on Kauai a great difference between the windward and leeward sides. I drove for about thirty miles along the windward side of this island through some of the most beautiful scenery of all the islands. Near the sea, were rolling plains and hills, with here and there groves of Pandanus and Hau — the latter a dense spreading small tree with large yellow hibiscus-flowers — and at one point we drove through a magnificent grove of kukui trees, the finest I saw anywhere. As we reached that part of the island which is most fully exposed to the moisture-laden trade-winds, vegetation became extremely luxuriant. Numerous valleys with clear streams flowing down them, their bottoms given up to rice plantations, were to be seen here, with the rice in all stages from the young spears just stand-

ing above the water to golden-yellow patches of ripe grain. At Hanalei, my destination, I found excellent accommodation and a delightful bathing beach, the latter especially attractive after a thirty-five-mile drive over dusty roads. Hanalei is beautifully situated on a picturesque bay with bold mountains rising directly back. The next morning a native was hired to go with me into the woods, and the day was spent in collecting. The variety of trees, as well as other phaenogams, is much greater here than in Hawaii; the ferns, also, were very fine. Here I obtained a prize in a fine lot of the prothallia and young plants of Marattia, as well as some other interesting things.

Want of space forbids going into details, but no botanist visiting the islands can afford to miss Kauai.

In position, the Hawaiian Islands are unique, being more isolated than any other land of equal area upon the globe. More than 2,000 miles separates them from the mainland, and 1,860 miles from the nearest high islands. Of purely volcanic origin, thrown up from an immense depth, they have always been thus isolated. As might be expected, the flora is very peculiar, more so than in any other country. According to Hillebrand, of 800 species of spermaphytes and pteridophytes that are strictly indigenous, 653 or seventy-five per cent. are endemic. Taking out the pteridophytes, the spermaphytes show over eighty-one per cent; and the dicotyledons over eighty-five per cent. that are found only in this group.

For a thorough study of this very curious flora, a long time would be necessary, as many species are extraordinarily local, and many of the most interesting localities are very difficult of access. The islands differ extremely among themselves, and exhibit in a most interesting manner the correspondence that exists between the variety and differentiation of forms and the ages of the islands. The formation of the islands has proceeded from north to south; and Kauai, the northernmost of the large islands of the group is also the oldest and much the richest botanically, especially as regards spermaphytes; and, according to Hillebrand, the genera and species are more differentiated. Hawaii, the southernmost of the islands, is much the poorest in forms, although in the Hilo district the conditions are most favorable for a luxuriant development of forms.

In the latter island is the last active volcano of the group, Mauna Loa with its two creaters, of which the well-known crater of Kilauea is the great sight of the islands and visited constantly by tourists from all parts of the world.

A few days after my return to Honolulu from Kauai, and six weeks from my first arrival there, I boarded the Monowai, the through Australian steamer bound for San Francisco, which was reached in due season after an uneventful passage. And so ended my first trip to the tropics.

Leland Stanford Junior University.

Botanical papers presented at the New Orleans meeting of the American Association of Agricultural Colleges and Experiment Stations.

L. H. PAMMEL.

The botanists in attendance at the New Orleans meeting were not numerous, and the same may be said of the horticulturists. On invitation of the botanists, the horticulturists met with them. The association later united the sections of botany and horticulture.

Papers enough were presented to take at least a forenoon and an afternoon, but owing to the meetings of the general sessions it was impossible to get all of the members together at any one time. The meetings at different times could only be an hour long. The meeting on Thursday morning was devoted to the important topic of the station and laboratory exhibit at the World's Columbian exposition, which was discussed by Dr. True and Prof. Tracy.

It would seem that more time should be given to a discussion of methods of investigation and more time allotted to the different sections. Botanical investigations appear to the writer to be an important part of station work.

The following papers were presented:

BYRON D. HALSTED: *Quince diseases.*—The following fungous troubles of the quince fruit were treated, namely: The quince rust (*Ræstelia aurantiaca* Pk.); the fruit spot (*Entomosporium maculatum* Lév.); the black rot of the quince (*Sphæropsis malorum* Pk.); the quince pale rot (*Phoma*